CLAIMS

WHAT IS CLAIMED IS:

1. A bearing system comprising:

a frame;

a shaft;

a rotor assembly mounted on the shaft;

at least one bearing supporting the shaft in the frame; and

a capacitance enhancement mechanism by which rotor to frame capacitance is increased.

2. The bearing system, as recited in claim 1, wherein the capacitance enhancement mechanism comprises a labyrinth, the labyrinth comprising a ground member, a shaft-voltage reducer, and one or more gaps disposed between the grounded member and the shaft-voltage reducer.

3. The bearing system, as recited in claim 2, wherein the one or more gaps are at least partially filled with dielectric material.

4. The bearing system, as recited in claim 3, wherein the dielectric material is ionized to create a continuous path for current flow.

5. The bearing system, as recited in claim 2, wherein the ground member is adjacent to the shaft and the shaft-voltage reducer is mounted on the shaft.

6. The bearing system, as recited in claim 1, wherein a common mode voltage on the shaft is reduced by a scaling factor determined by the capacitive enhancement mechanism.

7. An electromechanical device comprising:

a housing coupled to a grounded member having an enhanced surface area;

a shaft rotatably mounted to the housing; and

a shaft-voltage reducer mounted for rotation with the shaft, the shaft-voltage reducer having a corresponding surface configured to extend along the enhanced surface area to reduce common mode voltage, wherein one or more gaps are created between the grounded member and the shaft-voltage reducer.

8. The electromechanical device, as recited in claim 7, wherein the grounded member and the shaft-voltage reducer comprise a labyrinth.

9. The electromechanical device, as recited in claim 7, wherein the one or more gaps are at least partially filled with a dielectric material.

10. The electromechanical device, as recited in claim 9, further comprising a rotor, wherein the grounded member and the shaft-voltage reducer comprise a capacitive enhancement mechanism which increases rotor to frame capacitance.

11. The electromechanical device, as recited in claim 7, further comprising a rotor, wherein the grounded member and the shaft-voltage reducer comprise a capacitive enhancement mechanism which increases rotor to frame capacitance.

12. The electromechanical device, as recited in claim 11, wherein the common mode voltage on the shaft is reduced by a scaling factor determined by the capacitance enhancement mechanism.

13. The electromechanical device, as recited in claim 12, wherein the reduction of the common mode voltage reduces the incidence of bearing current discharges to a harmless level.

14. A system for reducing common mode voltage, comprising:

a pulse width modulated inverter producing a common mode voltage; and

a motor having:

a housing;

a stator assembly mounted to the housing;

a shaft;

a rotor assembly coupled to the shaft and rotatably mounted within the housing via at least one bearing; and

a capacitive enhancement mechanism coupled between the housing and the rotor, the capacitive enhancement mechanism having a capacitor formed by a pair of enhanced surfaces that undergo relative movement.

15. The system as recited in claim 14, wherein the pair of enhanced surfaces are comprised of a grounded member and a shaft-voltage reducer and where one or more gaps are disposed between the grounded member and the shaft-voltage reducer.

16. The system as recited in claim 15, wherein the grounded member is adjacent to the shaft and the shaft-voltage reducer is mounted on the shaft.

17. The system as recited in claim 15, further comprising a dielectric lubricant disposed to circulate within the one or more gaps.

18. The system as recited in claim 17, wherein the dielectric lubricant is ionized to create a continuous path for current flow.

19. The system as recited in claim 14, wherein the common mode voltage on the shaft is reduced by a scaling factor determined by the capacitance enhancement mechanism.

20. The system as recited in claim 19, wherein the capacitance enhancement mechanism increases rotor to housing capacitance and where the scaling factor is a bearing voltage ratio where the denominator of the bearing voltage ratio increases as rotor to housing capacitance increases.

21. The system as recited in claim 19, wherein the reduction of common mode voltage on the shaft reduces the incidence of bearing current discharges.

22. A method of reducing detrimental bearing current discharges in a system having a rotor shaft rotatably mounted within a frame, comprising:

presenting enhanced surface areas between the rotor shaft and the frame;

adjusting the difference between the enhanced surface areas to increase rotor shaft to frame capacitance; and

reducing rotor to ground voltage on the shaft during operation.

23. The method as recited in claim 22, further comprising reducing bearing current discharges.

24. The method as recited in claim 22, further comprising grounding one of the enhanced surface areas to the frame.

25. The method as recited in claim 24, further comprising forming the enhanced surface areas into a labyrinth.

26. The method as recited in claim 24, further comprising arranging one or more gaps between the enhanced surface areas and at least partially filling the gaps with a dielectric material.

27. The method as recited in claim 26, further comprising ionizing the dielectric material to create a continuous path for current flow.